

IN THE CLAIMS

The following is a complete listing of the claims. This listing replaces all earlier versions and listings of the claims.

Claims 1-40 (canceled)

Claim 41 (currently amended): A gradation conversion method for [[a]] radiation image data of an object radiographed ~~photographed~~ by a radiation photographing apparatus, said method comprising the steps of:

~~extracting a subject~~ an object area from the radiation image data;
~~changing pixel values constructing the subject~~ calculating average pixel
values;
~~obtaining added values by adding, in one direction, the changed pixel~~
values;
~~determining coordinates in the subject~~ of the object area based on the
~~added values~~ average pixel values calculated in said calculating step;
~~calculating a statistic from the~~ average pixel values that are within a
certain range, ~~in the image~~ including the coordinates in the object area determined in said
determining step;
~~forming a gradation conversion curve based on the statistic~~ calculated
in said statistic calculating step; and
~~converting the radiation image~~ data by using the gradation conversion
curve formed in said forming step.

wherein pixels in the object area are scanned in a y-axis direction to calculate the average pixel values in said average pixel value calculating step and a coordinate at which the average pixel values show a maximum or minimum is determined as a y-coordinate of the coordinates.

Claim 42 (currently amended): A method according to Claim 41, wherein in said subject extracting step an object area is extracted on the basis of an area through which radiation passes and an area adjacent thereto, wherein the adjacent area is within a given distance of the area through which radiation passes ~~includes calculating a representative value representative of a passing through area in the image, and deleting, from the image, pixels equal to or exceeding the representative value and pixels within a certain distance from the pixels.~~

Claim 43 (currently amended): A method according to Claim 41 or 42, wherein the average pixel values calculated in said calculating step are calculated by adding pixel values ~~said changing step includes counting the total number of pixels included in an area linearly extending from one contour line of the subject object to the other contour line of the object in the y-axis direction to the other contour line of the subject in the one direction, and dividing the added pixel values included in the linearly extending area by a number of pixels~~ ~~[[the]] corresponding total number counted in said counting sub-step to the added pixel values.~~

Claims 44-48 (canceled)

Claim 49 (currently amended): A method according to Claim 41, further comprising the steps of:

~~causing an X-ray irradiating unit to irradiate the subject~~ irradiating the object with X-rays from an X-ray irradiating unit; and

~~converting radiation passed the subject~~ transmitted through the object into [[a]] radiation image data using [[by]] a two-dimensional sensor.

Claim 50 (previously presented): A method according to Claim 41, wherein the statistic is an intermediate value or a mean value.

Claim 51 (currently amended): A program which is used to execute a gradation conversion method for [[a]] radiation image data of an object radiographed ~~photographed~~ by a radiation photographing apparatus, said [[method]] program comprising the steps of:

code for extracting a subject ~~an object area~~ from the radiation image data;

~~changing pixel values constructing the subject~~ code for calculating average pixel values;

~~obtaining added values by adding, in one direction, the changed pixel~~ values;

code for determining coordinates in the subject of the object area based on the ~~added values~~ average pixel values calculated by said code for a calculating step;

code for calculating a statistic from the average pixel values that are within a certain range, in the image including the coordinates in the object area determined by said code for a determining step;

code for forming a gradation conversion curve based on the statistic calculated by said code for a statistic calculating step; and

code for converting the radiation image data by using the gradation conversion curve formed by said code for a forming step,

wherein pixels in the object area are scanned in a y-axis direction to calculate the average pixel values using said code for calculating average pixel values and a coordinate at which the average pixel values show a maximum or minimum is determined as a y-coordinate of the coordinates.

Claim 52 (currently amended): A computer-readable storage medium which stores a program to execute a gradation conversion method for [[a]] radiation image data of an object radiographed ~~photographed~~ by a radiation photographing apparatus, said [[method]] program comprising ~~the steps of:~~

code for extracting a subject an object area from the radiation image data;

~~changing pixel values constructing the subject~~ code for calculating average pixel values;

~~obtaining added values by adding, in one direction, the changed pixel values;~~

code for determining coordinates in the subject of the object area based on the ~~added values~~ average pixel values calculated by said code for a calculating step;

code for calculating a statistic from the average pixel values that are within a certain range, in the image including the coordinates in the object area determined by said code for a determining step;

code for forming a gradation conversion curve based on the statistic calculated by said code for a statistic calculating step; and

code for converting the radiation image data by using the gradation conversion curve formed by said code for a forming step,

wherein pixels in the object area are scanned in a y-axis direction to calculate the average pixel values using said code for calculating average pixel values and a coordinate at which the average pixel values show a maximum or minimum is determined as a y-coordinate of the coordinates.

Claim 53 (currently amended): A radiation photographing apparatus having a gradation conversion function, said apparatus comprising:

an X-ray irradiating unit for irradiating an object with an X-ray;

a two-dimensional sensor for converting ~~radiation irradiated by the X-ray irradiating unit~~ the irradiation transmitted by said X-ray irradiating unit through the object into a radiation image ~~[[signal]]~~ data;

~~a subject~~ an object area extracting unit for extracting ~~a subject~~ an object area from ~~a radiation image represented by the radiation image signal~~ the radiation image data;

~~a changing unit for changing pixel values constructing the subject;~~

~~an adding unit for obtaining added values by adding, in one direction,~~
~~the changed pixel values~~ a calculating unit for calculating average pixel values;

~~a coordinate determining unit for determining coordinates in the subject~~
~~based on the added values~~ of the object area based on the average pixel values calculated by said
calculating unit;

~~a calculating unit for calculating a statistic from the average pixel~~
~~values within a certain range, in the image~~ including the coordinates in the object area;

~~a curve forming step of unit~~ for forming a gradation conversion curve
based on the statistic calculated by said calculating unit; and

~~a gradation converting unit for converting the radiation image data by~~
~~using the gradation conversion curve formed by said curve forming unit,~~

wherein the pixels of the object area are scanned in the y-axis direction
to calculate the average pixel values using said calculating unit for calculating average pixel
values, and a coordinate at which the average pixel values show a maximum or minimum is
determined as a y-coordinate of the coordinates.

Claim 54 (currently amended): A radiation photographing apparatus having a
gradation conversion function, said apparatus comprising:

~~an X-ray irradiating circuit for irradiating~~ an object with an X-ray;

~~a two-dimensional sensor for converting radiation irradiated by the~~
~~X-ray irradiating circuit~~ the irradiation transmitted by said X-ray irradiating circuit into [[a]]
radiation image [[signal]] data;

~~a passing through detecting circuit for calculating a value representative of a passing through area in a radiation image represented by the radiation image signal, and extracting a subject subtracting pixels equal to or exceeding the representative value and pixels within a certain distance from the pixels;~~

an object area extracting circuit for extracting an object area from the radiation image data, wherein the object area is extracted on the basis of an area through which radiation passes and an area adjacent thereto, wherein the adjacent area is within a given distance of the area through which radiation passes;

~~a projection preparing circuit for calculating the total number of the pixels included in an area linearly extending from one contour line of the subject to the other contour line of the subject in one direction, dividing the pixel values included in the linearly extending area by the corresponding total number, and obtaining added values by adding the divided pixel values in one direction;~~

a calculating circuit for calculating average pixel values by adding pixel values from one contour line of the object to the other contour line of the object in the y-axis direction and dividing the added pixel values by a number of pixels corresponding to the added pixel values;

~~a projection analyzing circuit for determining coordinates in the subject from coordinates of the pixel values used for calculating an added value indicative of the maximum value in the added values; and~~

a coordinate determining circuit for determining coordinates of the object area based on the average pixel values calculated by said calculating circuit; and

a gradation conversion processing circuit for calculating a statistic from the average pixel values, calculated by said average pixel value calculating circuit, within a certain range, ~~in the image~~ including the coordinates in the object area, forming a gradation conversion curve based on the calculated statistic, and converting the radiation image data by using the gradation conversion curve,

wherein the pixels of the object area are scanned in the y-axis direction to calculate the average pixel values, and a coordinate at which the average pixel values show a maximum or minimum is determined as a y-coordinate of the coordinates.